TRAUMA FROM OCCLUSION

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ADAPTIVE CAPACITY OF THE PERIODONTIUM TO OCCLUSAL FORCES

• Whenever a force is exerted on the crown of a tooth the periodontium attempts to accommodate it.
• Varies in different persons and in the same person at different times.
• The effect depends on the magnitude, direction, duration and frequency of the forces.

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TFO

• When occlusal forces exceed the adaptive capacity of the tissues, tissue injury results. The resultant injury is termed trauma from occlusion.

• TFO refers to the tissue injury, not the occlusal force.

• An occlusion that produces such injury is called a traumatic occlusion.
ACUTE AND CHRONIC TRAUMA

- **Acute**: results from an abrupt occlusal impact, e.g. biting on a hard object.

- **Chronic**: develops from gradual changes in occlusion produced by wear, drifting movement and extrusion of teeth along with parafunctional habits such as bruxism and clenching.

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• The criterion that determines if an occlusion is traumatic is whether it produces *periodontal injury*, not how the teeth occlude.
PRIMARY & SECONDARY TFO

• When TFO is the result of alterations in occlusal forces it is called primary TFO.

• When it results from reduced ability of the tissues to resist the occlusal forces it is known as secondary TFO.
Primary TFO

• Only alteration to which a tooth is subjected is occlusion.
  - insertion of a high filling
  - insertion of a prosthetic replacement that creates excessive forces on abutment and antagonistic teeth
Secondary TFO

- Occurs when adaptive capacity of tissues to withstand occlusal forces is impaired by bone loss.
- Previously well tolerated forces become traumatic.
STAGES OF TISSUE RESPONSE TO INCREASED OCCLUSAL FORCES

• STAGE I: Injury

• STAGE II: Repair

• STAGE III: Adaptive remodeling of the periodontium

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Stage I: Injury

• Tissue injury is produced by excessive occlusal forces.
• The body attempts to repair the injury and restore the periodontium.
• This can occur if the forces are diminished or if the tooth drifts away from them.
• **Chronic force** - periodontium is remodeled to cushion its impact.

• Ligament is widened at the expense of bone, resulting in angular bone defects **without periodontal pockets**, and the tooth becomes loose.
• **Axis of rotation / fulcrum**

• Single rooted teeth – located in the junction between the middle third and the apical third of the clinical root.

• Forces of occlusion create areas of pressure and tension on opposite sides of the fulcrum.
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Areas of periodontium most susceptible to injury from excessive occlusal forces are:

- Furcation areas
• Slightly excessive pressure:
  - stimulates resorption of alv. bone
  - Widening of pdl lig. space

• Slightly excessive tension:
  - Elongation of pdl lig. Fibers
  - Apposition of alv. bone
• Areas of increased **pressure** - blood vessels are numerous and reduced in size.

• Areas of increased **tension** - blood vessels are enlarged.
• GREATER PRESSURE

• Compression of fibers - areas of hyalinization

• Subsequent injury - necrosis of areas of ligament.

• Vascular changes - within 30 min- impairment and stasis of blood flow

• at 2-3 hrs blood vessels packed with erythocytes, which start to fragment

• between 1-7 days disintegration of blood vessel walls

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• SEVERE TENSION
• Widening of periodontal ligament
• Thrombosis
• Hemorrhage
• Tearing of pdl lig.
• Resorption of alv. bone

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• Pressure severe enough to force the root against the bone causes necrosis of the pdl lig and bone.
• The bone is resorbed from viable pdl lig adjacent to necrotic areas and from marrow spaces - undermining resorption.
Stage II: Repair

• Repair is constantly occurring in the normal periodontium and TFO stimulates reparative activity.

• When bone is resorbed by excessive occlusal forces, body attempts to reinforce the thinned bony trabeculae with new bone: buttressing bone formation.
TYPES OF BUTTRESSING

- **Central buttressing** - occurs within the jaw
- **Peripheral buttressing** - on the bone surface
- **Peripheral buttressing** produces a shelf like thickening on the alveolar margin termed as lipping.
Stage III: Adaptive Remodeling

• If the repair process cannot keep pace with the destruction, the periodontium is remodeled in an effort to create a structural relationship in which the forces are no longer injurious to the tissues.
• This results in a thickened pdl lig, which is *funnel shaped* at the crest, and *angular defects* in the bone with *no pocket formation*.

• The involved teeth become loose.
STAGES

• **Injury phase** – increase in areas of resorption and decrease in bone formation

• **Repair phase** – decreased resorption and increased bone formation

• **Adaptive remodeling** – resorption and formation return to normal
Insufficient Occlusal Force

- Thinning of pdl lig.
- Atrophy of the fibers
- Osteoporosis of alv. Bone
- Reduction in bone height
CAUSES

• Open-bite relationship
• Absence of functional antagonists
• Unilateral chewing habits
Reversibility of traumatic lesions

- TFO is reversible
- Injurious force must be removed for repair to occur
- Persistent trauma and inflammation impair the reversibility of traumatic lesions
Influence of TFO on progression of marginal periodontitis

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HISTORICAL BACKGROUND

• 1901: Karolyi postulated that interaction may exist b/w TFO & alveolar pyrrohea.

• Box (1935) & Stones (1938) reported experiments in sheep & monkeys.
CONCEPTS

• GLICKMAN CONCEPT (1965)
• WAERHAUG CONCEPT (1979)
GLICKMAN CONCEPT

• Progressive tissue destruction of the periodontium at a "traumatized tooth" will be different from that characterizing a "non-traumatized" tooth.

• Such teeth develop angular bony defects & infrabony pockets.
ZONES OF PERIODONTIUM

- **Zone of irritation**: marginal & interdental gingiva.
- **Zone of co-destruction**: periodontal ligament, the root cementum and the alveolar bone
• The spread of an inflammatory lesion from the zone of irritation directly down into the periodontal ligament (i.e. not via the interdental bone) may hereby be facilitated

• This alteration of the "normal" pathway of spread of the plaque-associated inflammatory lesion results in the development of angular bony defects.
WAERHAUG’S CONCEPT

• Examined autopsy specimens.
• Concluded that angular bony defects and infrabony pockets occur equally at periodontal sites of teeth which are not affected by TFO as in traumatized teeth.
CONCLUSIONS

- TFO cannot cause pocket formation.
- Causes bone resorption - s/be regarded as a physiological adaptation to the forces.
- In teeth with periodontitis, TFO may enhance the rate of progression of the disease, i.e. act as a co-factor in the destructive process.